BNC

INSTRUCTION MANUAL

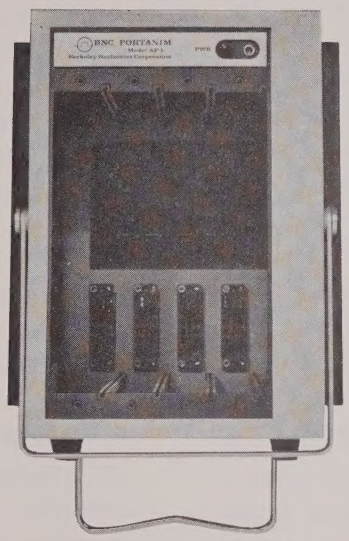
Portanim
Model AP-1

INSTRUCTION MANUAL

BERKELEY NUCLEONICS CORPORATION
1198 Tenth St., Berkeley, California 94710 • Phone: (415) 527-1121

Warranty

Berkeley Nucleonics Corporation warrants all instruments, including component parts, to be free from defects in material and workmanship, under normal use and service for a period of one year. If repairs are required during the warranty period, contact the factory for component replacement or shipping instructions. Include serial number of the instrument. This warranty is void if the unit is repaired or altered by others than those authorized by the Berkeley Nucleonics Corporation.



SECTION 1

SPECIFICATIONS

INPUT

115 VAC ±12% or 230 VAC ±12%, 50 to 60 Hz.

OUTPUT

Option A: ±12 V and ±24 V at 0.35 A;
Option B: ±12 V and -6 V at 0.35 A,
+6 V at 1.5 A

REGULATION

Better than ±0.05% combined line voltage variation (±12%) and no load to full load.

AMBIENT OPERATING TEMPERATURE

0°C to 50°C without derating.

TEMPERATURE COEFFICIENT OF OUTPUT VOLTAGES

Less than 0.02%/°C.

RIPPLE AND NOISE

Less than 3 mV peak-to-peak when observed with a 50 MHz bandwidth oscilloscope.

OUTPUT ADJUSTMENT

Output voltages are adjustable over a range of ±0.5% and resettable to ±0.05%.

RECOVERY TIME

Less than 50 μs to return to within regulation limits for a step change in load of 100%.

CIRCUIT PROTECTION

The supply is fully protected against output short circuits or overloads. Internal circuitry limits maximum overload current to 20% over rated maximum current.

FINISH

Baked vinyl paint, textured. Side panels, charcoal gray. Body, light gray.

CONNECTORS

Each bin contains four AMP 202516-3 connectors wired to DC output buses, high quality ground, power return ground and 115 VAC.

MECHANICAL

8.5" W x 11.625" H x 14.75" D.

WEIGHT

11 lbs (5.0 kg), net; 17 lbs (7.7 kg), shipping.

SECTION 2

CIRCUIT DESCRIPTION

2.1 INTRODUCTION

The Portanim Model AP-1 is a portable carrying case and power supply for any combination of up to four single-width NIM modules. The self-contained power supply conforms to all specifications of AEC Report TID-20893 (Rev. 2) except for maximum current ratings as shown under specifications.

Refer to Schematic AP-101 at the back of the manual. The AP-1 power supply consists of four similar regulator circuits. These circuits may be arranged for ±24 V and ±12 V operation or for ±12 V and ±6 V operation. Where two values are shown for the same component, the first value is for 24 V and 12 V operation (Option A) and the second value, in parentheses, is for 12 V and 6 V operation (Option B).

Power transformer T1 may be operated on either 115 VAC or 230 VAC 50/60 Hz. Connections for the respective line voltages are made on the terminal strip (next to T1) as shown on the schematic. When T1 is connected for 230 V operation, the BLK-BLK/RED winding on the primary functions as an auto transformer to supply up to 0.25 A at 115 VAC to connector pins 33 and 41. Secondary connections are made to the 30 V and 16 V windings for 24 V and 12 V operation and to the 16 V and 10 V windings for 12 V and 6 V operation.

2.2 +24 VOLT SUPPLY

The following discussion refers to the +24 V supply. However, the other supplies function in a similar manner. The full-wave rectifier D6, D13 and filter capacitor C7 provide unregulated DC to the +24 V regulator. The output current passes through the power transistor Q6. The regulated output voltage is divided by R14, R15 and R16 to +8.4 V at the junction of R15 and R16, where it is compared by differential amplifier Q1 and Q2 to the 8.4 V reference Zener diode. The amplified difference signal on the collectors of Q1 and Q2 is coupled to the bases of the second differential amplifier, Q3 and Q4. The difference signal is coupled from the collector of Q3 to inverter Q5. The signal is then applied to the base of series-pass transistor Q6, closing the feedback loop. The operating point of the regulator is set by adjusting R14.

2.3 CURRENT LIMITING

Current limiting is provided by sensing the output current across R4, which is in series with the emitter of series-pass transistor Q6. When the output current exceeds the preset value, the drop across R4 increases to the point where D1 conducts, tending to turn on Q5. As Q5 turns on, Q6 shuts off, thereby limiting the current which can be supplied by the regulator.

The other regulators operate in a similar manner, except that the reference for the -12 V and -24 V supplies is the +24 V bus and the reference for +12 V supply is the -12 V bus. The location of the trimmers for adjusting the respective supplies is shown on Schematic AP-101. The schematic is drawn to show point-to-point contacts to provide feedback sensing at the output connector pins. In addition, all grounds terminate at tie-point Z (shown adjacent to the +24 V supply).

IMPORTANT

When troubleshooting, first make sure the +24 V supply is functioning properly; next, check the -12 V and -24 V supply and finally, check the +12 V supply.

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SECTION 3
PARTS LIST

Abbreviations

μH	microhenry	cer	disc ceramic
μF	microfarad	comp	composition carbon
pF	picofarad	dep car	deposited carbon
poly	polystyrene	elec	electrolytic
pot	potentiometer	mic	mica
tan	tantalum	myl	Mylar
V	dc working volts	k	kilohm
W	watts	M	megohm
ww	wirewound	mf	metal film

NOTE: WHEN TWO VALUES ARE GIVEN, SUFFIX "A" REFERS TO OPTION A AND SUFFIX "B" REFERS TO OPTION B.

Capacitors

C1	250 pF	cer	1 kV
C2	0.47 μF	cer	10 V
C3	0.01 μF	cer	1 kV
C4	470 pF	cer	1 kV
C5	100 μF	elec	25 V
C6	0.01 μF	cer	1 kV
C7	1,000 μF	elec	50 V
C8 (A)	1,000 μF	elec	50 V
C8 (B)	4,000 μF	elec	15 V
C9	0.01 μF	cer	1 kV
C10	0.01 μF	cer	1 kV
C11	0.01 μF	cer	1 kV
C12	0.01 μF	cer	1 kV
C13	250 pF	cer	1 kV
C15	1,000 μF	elec	50 V
C16	1,000 μF	elec	50 V
C17	0.47 μF	cer	10 V
C18	100 μF	elec	25 V
C19	0.01 μF	cer	1 kV
C20	2X 0.47 μF	cer	10 V
C21	100 μF	elec	25 V
C22	0.01 μF	cer	1 kV
C23	250 pF	cer	1 kV
C24	0.47 μF	cer	10 V
C25	470 pF	cer	1 kV
C26	100 μF	elec	25 V
C27	0.01 μF	cer	1 kV
C28	250 pF	cer	1 kV
C29	25 pF	cer	1 kV

Transformer

T1	Transformer (Part No. 320-002)

Diodes

D1	1N4154
D2	1N3154
D3	1N4154
D4	1N4154
D5	1N4154
D6	1N4005
D7	1N4005
D8 (A)	1N4005
D8 (B)	1N4005
D9	1N4005
D10	1N4005
D11 (A)	1N4005
D11 (B)	1N4005
D13	1N4005
D14	1N4005
D15	1N4154
D16	1N4154
D17	1N4154
D18	1N4154
D19	1N4154
D20	1N4154
D21	1N4154
D22	1N4154

Fuse

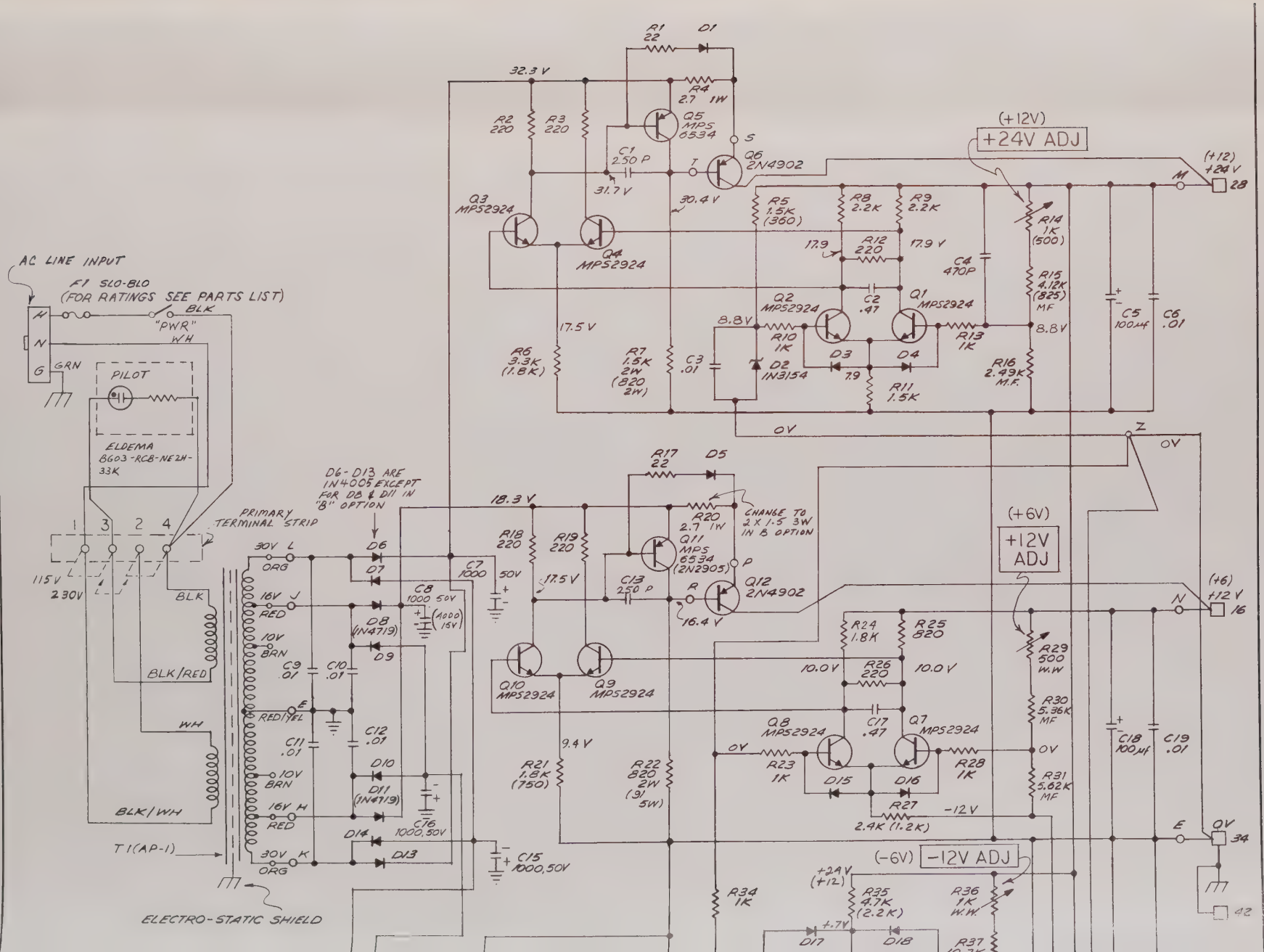
F1	1.5 A Slo-Blo for 115 VAC (Littlefuse 31301.5)
	OR
	3/4 A Slo-Blo for 230 VAC (Littlefuse 313.750)

Resistors

R1	22 ohms	1/2 W	comp	5%
R2	220 ohms	1/2 W	comp	5%
R3	220 ohms	1/2 W	comp	5%
R4	2.7 ohms	1 W	comp	5%
R5 (A)	1.5 k	1/2 W	comp	5%
R5 (B)	360 ohms	1/2 W	comp	5%
R6 (A)	3.3 k	1/2 W	comp	5%
R6 (B)	1.8 k	1/2 W	comp	5%
R7 (A)	1.5 k	2 W	comp	5%
R7 (B)	820 ohms	1 W	comp	5%
R8	2.2 k	1/2 W	comp	5%
R9	2.2 k	1/2 W	comp	5%
R10	1 k	1/2 W	comp	5%
R11	1.5 k	1/2 W	comp	5%
R12	220 ohms	1/2 W	comp	5%
R13	1 k	1/2 W	comp	5%
R14 (A)	1 k	0.6 W	trimmer	
R14 (B)	500 ohms	0.6 W	trimmer	
R15 (A)	4.12 k	1/2 W	mf	1%
R15 (B)	825 ohms	1/2 W	mf	1%
R16	2.49 k	1/2 W	mf	1%
R17	22 ohms	1/2 W	comp	5%
R18	220 ohms	1/2 W	comp	5%
R19	220 ohms	1/2 W	comp	5%
R20 (A)	2.7 ohms	1 W	comp	5%
R20 (B)	2x1.5 ohms	3 W	ww	5%
R21 (A)	1.8 k	1/2 W	comp	5%
R21 (B)	750 ohms	1/2 W	comp	5%
R22 (A)	820 ohms	2 W	comp	5%
R22 (B)	91 ohms	5 W	ww	5%
R23	1 k	1/2 W	comp	5%
R24	1.8 k	1/2 W	comp	5%
R25	820 ohms	1/2 W	comp	5%
R26	220 ohms	1/2 W	comp	5%
R27 (A)	2.4 k	1/2 W	comp	5%
R27 (B)	1.2 k	1/2 W	comp	5%
R28	1 k	1/2 W	comp	5%
R29	500 ohms	0.6 W	trimmer	
R30	5.36 k	1/2 W	mf	1%
R31	5.62 k	1/2 W	mf	1%
R32 (A)	1.8 k	1/2 W	comp	5%
R32 (B)	750 ohms	1/2 W	comp	5%
R33 (A)	820 ohms	2 W	comp	5%
R33 (B)	560 ohms	1 W	comp	5%
R34	1 k	1/2 W	comp	5%
R35 (A)	4.7 k	1/2 W	comp	5%
R35 (B)	2.2 k	1/2 W	comp	5%
R36	1 k	0.6 W	trimmer	
R37	10.7 k	1/2 W	mf	1%
R38	1 k	1/2 W	comp	5%
R39	220 ohms	1/2 W	comp	5%
R40	5.62 k	1/2 W	mf	1%
R41	820 ohms	1/2 W	comp	5%
R42	820 ohms	1/2 W	comp	5%
R43	220 ohms	1/2 W	comp	5%
R44	220 ohms	1/2 W	comp	5%
R45	22 ohms	1/2 W	comp	5%
R46	2.7 ohms	1 W	comp	5%
R47 (A)	4.7 k	1/2 W	comp	5%
R47 (B)	2.2 k	1/2 W	comp	5%
R48	1 k	1/2 W	comp	5%
R49 (A)	3.3 k	1/2 W	comp	5%
R49 (B)	1.8 k	1/2 W	comp	5%
R50 (A)	1.5 k	2 W	comp	5%
R50 (B)	820 ohms	2 W	comp	5%
R51	1 k	0.6 W	trimmer	
R52	10.7 k	1/2 W	mf	1%
R53	1 k	1/2 W	comp	5%
R54	220 ohms	1/2 W	comp	5%
R55	220 ohms	1/2 W	comp	5%
R56	220 ohms	1/2 W	comp	5%
R57	22 ohms	1/2 W	comp	5%
R58	2.7 ohms	1 W	comp	5%
R59 (A)	2.2 k	1/2 W	comp	5%
R59 (B)	820 ohms	1/2 W	comp	5%
R60 (A)	2.2 k	1/2 W	comp	5%
R60 (B)	820 ohms	1/2 W	comp	5%
R61	11 k	1/2 W	mf	1%

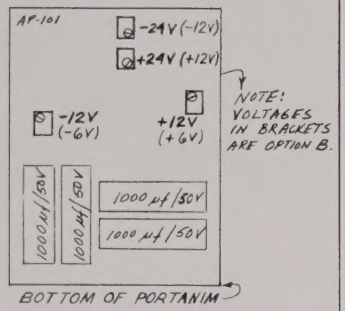
Transistors

Q1	MPS 2924
Q2	MPS 2924
Q3	MPS 2924
Q4	MPS 2924
Q5	MPS 6534
Q6	2N4902
Q7	MPS 2924
Q8	MPS 2924
Q9	MPS 2924
Q10	MPS 2924
Q11 (A)	MPS 6534
Q11 (B)	2N2905
Q12	2N4902
Q13	MPS 6518
Q14	MPS 6518
Q15	MPS 6518
Q16	MPS 6518
Q17	MPS 6531
Q18	2N5068
Q19	MPS 6518
Q20	MPS 6518
Q21	MPS 6518
Q22	MPS 6518
Q23	MPS 6531
Q24	2N5068

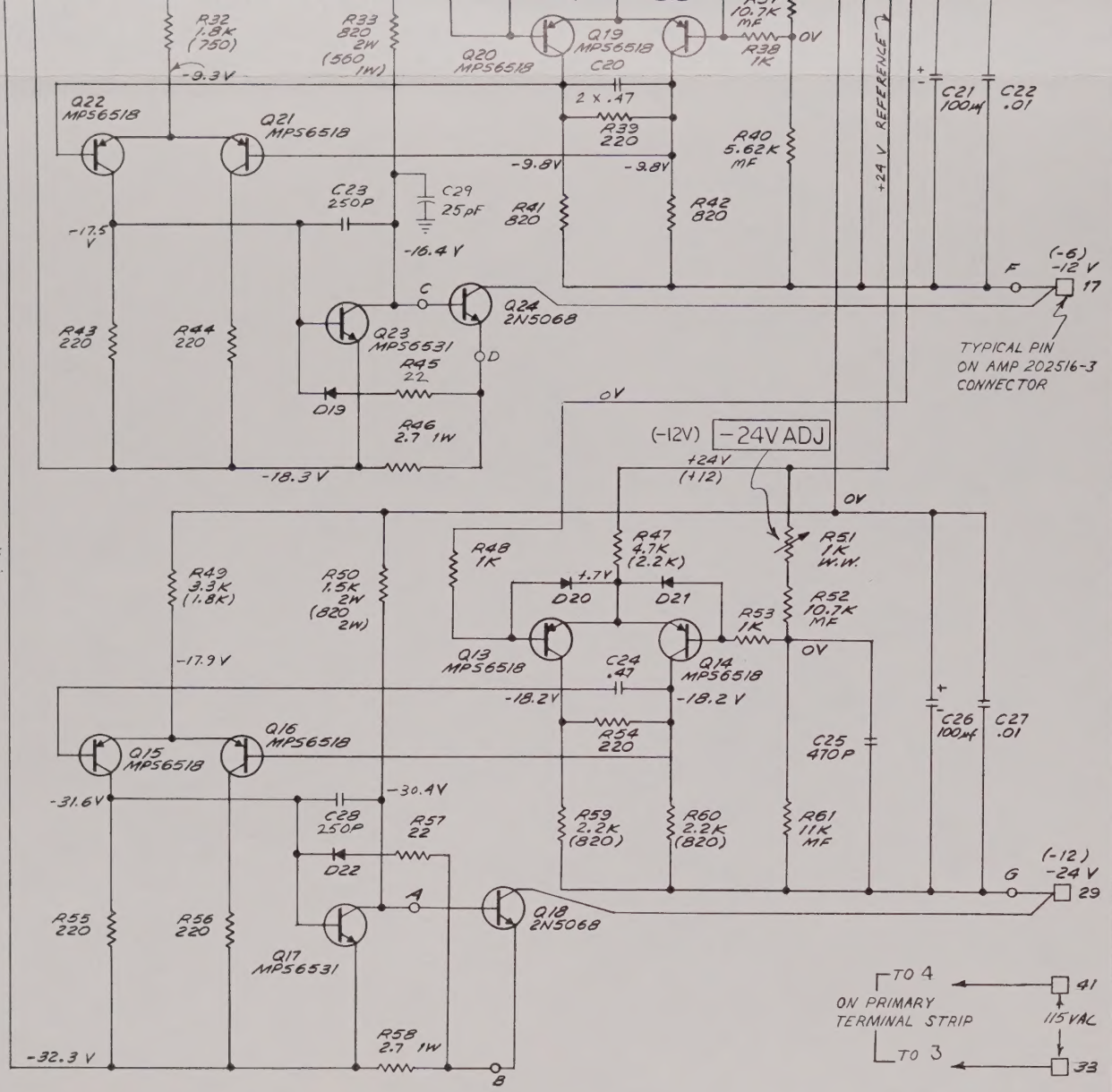

AC LINE INPUT
F1 SLO-BLO
(FOR RATINGS SEE PARTS LIST)
BLK
"PWR"
WH
GRN
PILOT
ELDEMA
BG03-RCB-NE2H-
33K
PRIMARY
TERMINAL STRIP
1 3 2 4
115V
230V
BLK
BLK/RED
WH
BLK/WH
T1(AP-1)
ELECTRO-STATIC SHIELD
30V L
ORG
16V J
RED
10V
BRN
E
RED/YEL
10V
BRN
16V H
RED
30V K
ORG
D6-D13 ARE
IN4005 EXCEPT
FOR D8 & D11 IN
"B" OPTION
R1
22
D1
32.3 V
R4
2.7 1W
R2
220
R3
220
Q5
MPS
6534
S
C1
2.50 P
T
Q6
2N4902
31.7 V
30.4 V
Q3
MPS2924
Q4
MPS2924
(+12V)
+24V ADJ
(+12)
+24 V
M
28
R5
1.5K
(360)
R8
2.2K
R9
2.2K
R14
1K
(500)
17.9
R12
220
17.9 V
C4
470P
R15
4.12K
(825)
MF
Q2
MPS2924
C2
.47
Q1
MPS2924
C5
100μf
C6
.01
8.8V
R10
1K
R13
1K
8.8V
17.5 V
R6
3.3K
(1.8K)
R7
1.5K
2W
(820
2W)
C3
.01
D2
IN3154
D3
D4
7.9
R11
1.5K
R16
2.49K
M.F.
0V
Z
0V
R17
22
D5
18.3 V
R20
2.7 1W
CHANGE TO
2 X 1.5 3W
IN B OPTION
R18
220
R19
220
Q11
MPS
6534
(2N2905)
P
C13
250 P
R
Q12
2N4902
17.5 V
16.4 V
(+6V)
+12V
ADJ
(+6)
+12 V
N
16
R24
1.8K
R25
820
R29
500
W.W
10.0V
R26
220
10.0 V
R30
5.36K
MF
Q10
MPS2924
Q9
MPS2924
C17
.47
Q8
MPS2924
Q7
MPS2924
C18
100μf
C19
.01
9.4 V
0V
R23
1K
R28
1K
0V
R21
1.8K
(750)
R22
820
2W
(3)
5W)
D15
D16
R31
5.62K
MF
R27
2.4K (1.2K)
-12V
E
0V
34
C7
1000
50V
C8
1000 50V
(1000
15V)
D8
(IN4719)
D9
C9
.01
C10
.01
C12
.01
C11
.01
D10
D11
(IN4719)
C16
1000,50V
D14
D13
C15
1000,50V
(-6V)
-12V ADJ
+24V
(+12)
R34
1K
R35
4.7K
(2.2K)
R36
1K
W.W
+7V
D17
D18
R37
42

NOTES:

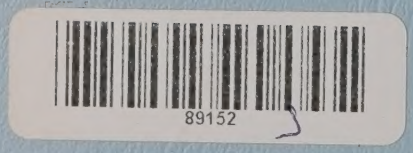
1. ALL METAL FILM RESISTORS ARE MF-7C
2. ALL DIODES ARE 1N4154, UNLESS OTHERWISE MARKED.
3. ALL VOLTAGE READINGS TAKEN WITH SUPPLIES LOADED TO MAX. RATING AND LINE AT 115VAC. OPTION A WIRING.
4. ALL VALUES OF COMPONENTS & VOLTAGES WITH PARENTHESES AROUND THEM ARE FOR OPTION B, ±12V AND ±6V
5. TRANSFORMER SECONDARY CONNECTIONS FOR OPTION B ARE TO THE 10V AND 16V TAPS.
6. 115VAC / 230VAC CONNECTIONS: FOR 115VAC CONNECT 1 TO 3 AND 2 TO 4 (AS SHOWN ABOVE). FOR 230VAC CONNECT ONLY 2 TO 3.



LOCATION OF VOLTAGE ADJ. TRIMMERS



BERKELEY NUCLEONICS CORP. 1198 TENTH ST. BERKELEY, CAL.	
SCALE	
DATE 5-2-68	APPROVED BY R.G.
DRAWN BY A.L.	REVISED 7/6/70
PORTANIM MODEL AP-1	
POWER SUPPLY	DRAWING NUMBER AP-101 B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